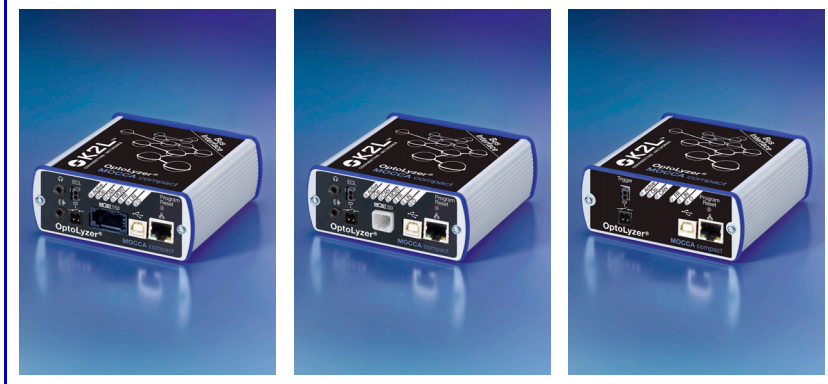
OptoLyzer® MOCCA compact V3.1



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Chapter 1 Preface

1.1 Intended Use

The OptoLyzer MOCCA compact is intended to be used for developing, testing, or analyzing CAN®, FlexRay™, LIN®, or MOST® based automotive products and systems by persons with experience in developing automotive devices.

1.2 Scope of Delivery

The OptoLyzer MOCCA compact is the hardware part of the following K2L products (e.g.):

- ATS
- OptoLyzer MOCCA compact bundle
  (inclusive OptoLyzer Suite support for MOST50 and MOST150)

The delivery covers the following:

- OptoLyzer MOCCA compact
- Power cable
- MOST cable
- USB cable
- USB stick (license dongle)
- CAN termination resistors (optional)
- Sync and power cable (optional)
- Adaptation Kit (optional)

Check your shipment for completeness. If you have any complaints direct them to sales@K2L.com. Providing the delivery note number eases the handling.

1.3 Definitions of Terms

For better understanding of the following chapters, this section provides explanation to special terms, used in the description of the OptoLyzer MOCCA compact user manual.

Table 1.1 Definitions of Terms

TERM / ABBREVIATION	DESCRIPTION
ATS	Automotive Test System
CAN	Controller Area Network
D	Depth
DUT	Device Under Test
ECL	Electrical Control Line, a method to wake up ECUs in MOST networks.
ECU	Electronic Control Unit
FlexRay	Automotive network communications protocol
H	Height
LIN	Local Interconnect Network
Low speed CAN Transceiver	Fault tolerant CAN Transceiver
MDIX	Medium Dependent Interface Crossover
MediaLB®	Media Local Bus
MOST®	Media Oriented Systems Transport
RCA	Type of electrical connector used for transmitting audio and video signals (introduced from Radio Corporation of America).
Sync	Synchronization
S/PDIF	Sony/Philips Digital Interconnect Format
USB	Universal Serial Bus
W	Width

1.4 References

[1] Electrical Physical Layer Specification Version 2.0
Refer to FlexRay Consortium.

[2] International Organization for Standardization
http://www.iso.org

[3] Telecommunications Industry Association
http://www.tiaonline.org

[4] International Electrotechnical Commission
http://www.iec.ch

Chapter 2 Safety Instructions

2.1 Supply and Synchronization

The OptoLyzer MOCCA compact devices could be cascaded via Sync/Power connector. One of the two Sync/Power connectors is intended to be used for the power supply and the other for cascading the OptoLyzer MOCCA compact by using an optional sync cable.

During cascading, caution has to be taken, since the first device in the chain can take the maximum current of 3 A. Do not cascade more than eight devices in chain.

For all setups either a fuse of max. 4 A in the supply cable to the first device or the use of the current limitation of the laboratory power supply is mandatory.

2.2 Relay

The Relay feature of the device is designed to switch other 12 V powered devices. The capability is limited to 5 A at 16 V maximum. Always use core cable ends of appropriate length and diameter to prevent unintended connections.

Chapter 3 Definitions Limit Class

3.1 Emission

The OptoLyzer MOCCA compact has passed the requirements according to the standard EN 55022:2010, class A.

Warning

The OptoLyzer MOCCA compact is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Chapter 4 Introduction

The OptoLyzer MOCCA compact is an out of the box automotive bus interface, combining most of the current automotive field buses. The device can be used e.g., as an automotive bus interface featuring simulation via PC or as an analyzing device for the different automotive bus networks.

Due to its PC compatible connections including USB 2.0 and 10/100 Mbit/s Ethernet, it is easily possible to control the embedded OptoLyzer MOCCA compact software from the PC including monitoring, tracing, and logging of data exchange over the different field bus systems. On MOST the OptoLyzer MOCCA compact provides comfortable spy and stress functionalities.

The OptoLyzer MOCCA compact is available in different hardware platforms optimized for dedicated use cases (e.g., with or without MOST connector, different MOST speed grades).

4.1 Feature Summary

The following list covers the key features of the hardware platform. Some of the options may not be available in specific configurations.

- 6 high speed CAN buses, two of them selectable either as high- or low-speed transceiver or single wire CAN
- 1 FlexRay bus
- 6 LIN buses
- MOST150, MOST50 or without MOST
- USB 2.0 port supporting high speed with 480 Mbit/s and full speed with 12 Mbit/s
- Ethernet connection with 10/100 Mbit/s
- S/PDIF coaxial input and output for audio streaming over MOST
- Analog audio input and output for audio streaming over MOST
- MOST ECL support or generic trigger in-/output
- Relay to switch external loads of up to 5 A
- Time stamp synchronisation with cascaded OptoLyzer MOCCA compact devices over power cables.
- SpyNIC for MOST on-board
- StressNIC for MOST on-board

4.2 Block Diagram

A block diagram shows the features available for the OptoLyzer MOCCA compact V3.1. In order to minimize crossing lines the FPGA was split in two blocks.

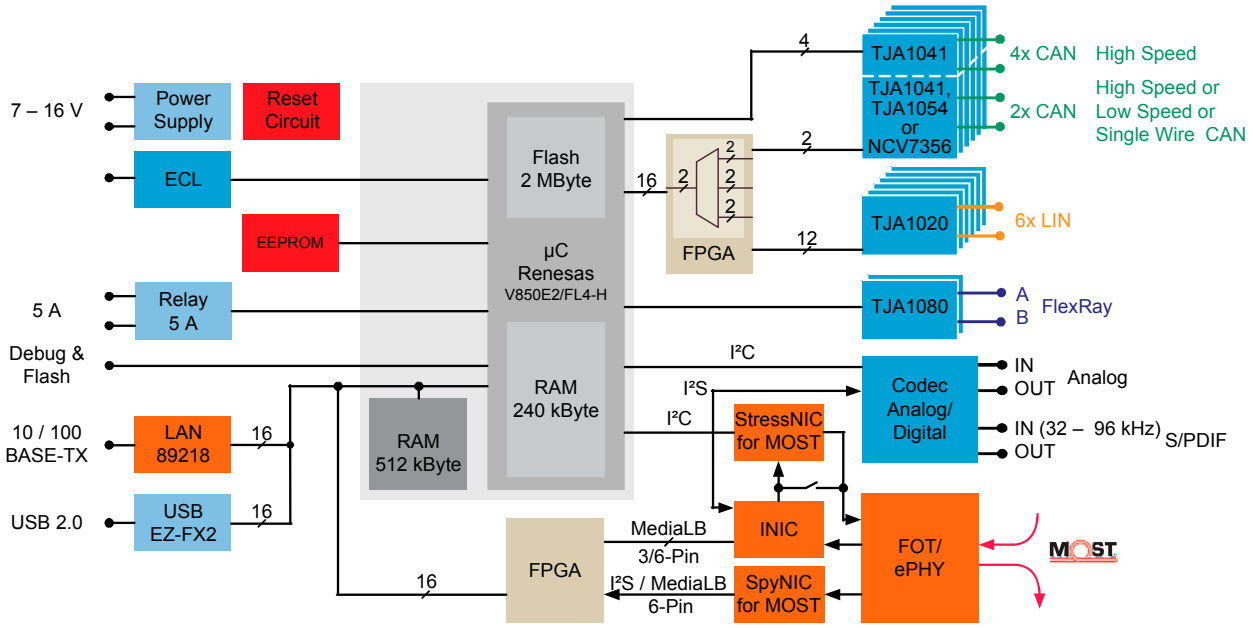

Figure 4.1 Block Diagram

4.3 Properties of Embedded Bus Systems

The OptoLyzer MOCCA compact is intended to be used as stimulation, test and analysis device for automotive field buses with DUTs connected to them. Therefore the design is constrained to ensure the behavior to be as passive as possible.

4.3.1 CAN

The accuracy of CAN time stamps is 500 µs.

4.3.1.1 High Speed Transceiver

High speed CAN bus systems according to ISO 11898-2 [2] are terminated with 120 Ω at each end. Therefore the OptoLyzer MOCCA compact does not terminate the bus. The transmission speed ranges from 33 kbits/s to 1 Mbits/s.

4.3.1.2 Low Speed Transceiver

Low speed CAN bus systems usually have a distributed termination. The value of the termination in each node depends on the number of nodes in the network. To avoid effects on the total impedance of the network the OptoLyzer MOCCA compact has a weak termination of 5.6 kΩ. A communication via the low speed transceivers ranges up to 125 kbits/s.

4.3.1.3 Single Wire Transceiver

The single wire CAN is terminated with 9.1 kΩ. The transmission speeds for single wire CAN are 33 kbits/s (on-board communication) and 83 kbits/s (off-board communication).

4.3.2 FlexRay

The termination of a FlexRay bus depends on the bus topology. Two terminations are mandatory in each active branch. The OptoLyzer MOCCA compact can be installed in various topologies. Therefore a termination is not implemented in the device. Thus the terminations have to be realized in a different way. In addition, the OptoLyzer MOCCA compact does not act as a bus guardian.

The OptoLyzer MOCCA compact provides one FlexRay bus and is able to switch from sleep mode to wake-up mode stimulated by the FlexRay bus. The bus is capable of transmitting up to 10 Mbit/s (brutto) as per "Electrical Physical Layer Specification Version 2.0". The accuracy of FlexRay time stamps is 500 µs for the static part of the schedule.

4.3.3 LIN

Both LIN master and LIN slave functionality are supported. The accuracy of LIN time stamps is 1 µs. The OptoLyzer MOCCA compact supports a maximum transmission speed of 20 kbit/s (brutto).

4.3.4 MOST

The OptoLyzer MOCCA compact platform supporting MOST50 is able to switch the clock mode of the embedded OS81082 INIC and thus supports a 44.1 kHz as well as a 48 kHz network whereas the OptoLyzer MOCCA compact platform designed for a MOST150 network has a fixed clock mode of 48 kHz. OptoLyzer MOCCA compact platforms of any speed grade have an INIC, a SpyNIC for MOST and a StressNIC for MOST on-board. The accuracy of INIC MOST time stamps is 500 µs.

When analyzing data e.g., when interpreting an acknowledged code, it is important to know how the chips (INIC, SpyNIC for MOST, StressNIC for MOST) are arranged inside the OptoLyzer MOCCA compact.

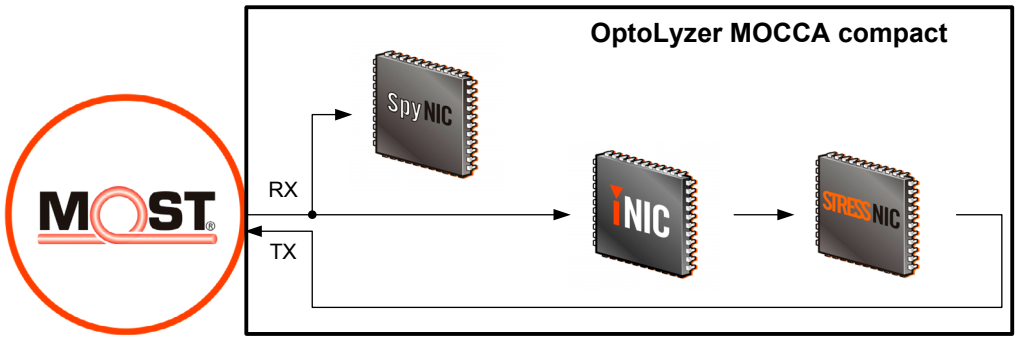

Figure 4.2 Order of Chips inside the OptoLyzer MOCCA compact

The MOST feature is optional for OptoLyzer MOCCA compact platforms i.e., there are OptoLyzer MOCCA compact platforms supporting MOST50 or MOST150 or without MOST. [1]

4.3.4.1 MOST 50

Data exchange between the OptoLyzer MOCCA compact and the embedded OS81082 INIC is realized by MediaLB 3-Pin with 1024Fs.

4.3.4.2 MOST 150

Data exchange between the OptoLyzer MOCCA compact and the embedded OS81110 INIC is realized by MediaLB 6-Pin with 2048Fs.

4.3.4.3 SpyNIC for MOST

Each speed grade of an OptoLyzer MOCCA compact has also an appropriate SpyNIC for MOST on-board. Both speed grade variants of the SpyNIC are spying control, packet, and allocation messages. A node is realized at the same time. The accuracy of SpyNIC time stamps is 1 µs.

4.3.4.4 StressNIC for MOST

Each speed grade of an OptoLyzer MOCCA compact has also an appropriate StressNIC for MOST on-board. Both speed grade variants of the StressNIC are supporting dedicated use cases for simulating some common network error situations (e.g., light/lock stress, buffer full simulation etc). By default the StressNIC for MOST is electrically bypassed but can be enabled by appropriate software (e.g., ATS).

1.An optical MOST25 interface is provided by the former hardware version MOCCA compact V2.3.

4.3.5 Ethernet

Auto MDIX is supported, therefore the LAN interface can connect via straight and crossed patch cables. The physical layer 100BASE-TX is supported. The OptoLyzer MOCCA compact is able to configure different MACs during run-time. The accuracy of Ethernet time stamps is 500 µs.

4.3.6 Sleep Mode

The OptoLyzer MOCCA compact is able to scan the six CAN buses in sleep mode and if stimulated to switch from sleep mode into wake-up mode. In addition, the OptoLyzer MOCCA compact can be waked-up via FlexRay, LIN or ECL.

Chapter 5 Hardware Description

5.1 Front Panel

Different hardware platforms are available for the OptoLyzer MOCCA compact. Figure 5.1 depicts a platform supporting MOST150.

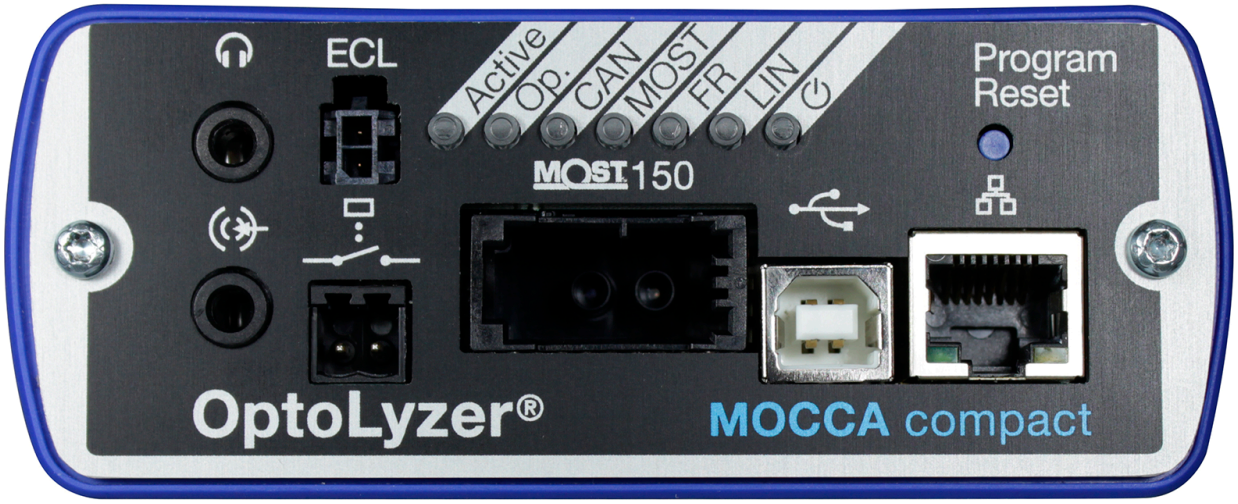

Figure 5.1 Front Panel (E.G.)

All components of the front panel are described below. Table 5.1 describes the connectors from left to right and top to down whereas Table 5.2 describes the LEDs.

Table 5.1 Connectors on the Front Panel

INTERFACE	SYMBOL	DESCRIPTION
Analog Audio Out		The OptoLyzer MOCCA compact provides one headphone stereo output. It has a 3.5 mm jack plug. Output Power: $P_{o, Max, Rms}$ = 1.4 mW (at R = 16 Ω, V_{out} = 150 mV_{RMS})
ECL or Trigger		OptoLyzer MOCCA compact platforms supporting MOST: ▪ ECL can be used to wake-up the OptoLyzer MOCCA compact according to different ECL implementations. OptoLyzer MOCCA compact platforms without MOST: ▪ The trigger can be used to wake-up the OptoLyzer MOCCA compact. Both trigger variants are realized using a LIN transceiver. For the pin out refer to Section 6.9, "ECL," on page 25.
Program Reset		The device can be reset by the push button. If the button is pressed for less than 1 s, the device is reset. The same button is used for switching into the flashing mode. For details see the “K2L Flasher Online Help” that is part of the shipment.
Analog Line IN		The OptoLyzer MOCCA compact provides one analog audio Line IN. The analog Line IN input impedance is 10 kΩ. The analog input are converted into digital streams with resolutions of 8, 16 or 24 bits / channel, both mono and stereo. It has a 3.5 mm jack plug.
Relay		The relay is able to switch 5 A as a potential free shutter. For safety purposes refer to Chapter 2, "Safety Instructions," on page 9. For the pin out refer to Section 6.8, "Relay," on page 25.
MOST		This interface is only available on platforms that are supporting MOST. Each OptoLyzer MOCCA compact has only one MOST connector i.e., either a MOST150 connector or a MOST50 connector. The MOST50 connector bases on an electrical physical layer (ePhy) whereas the MOST150 connector bases on an optical physical layer (oPhy). For the pin out refer to Section 6.10, "MOST Connector," on page 26.
USB		The USB port is a standard USB B-type receptacle.
LAN		The LAN connector is an RJ45 receptacle according to TIA-568 [3].

The OptoLyzer MOCCA compact offers seven LEDs. All LEDs except the Power LED are tri-colors.

Table 5.2 LEDs

INTERFACE	SYMBOL	DESCRIPTION	COLOR	DESCRIPTION
Active	Active	This LED indicates any activity.	Red	Reserved
			Green	Reserved
			Blue	Firmware running
Operation	Op.	This LED indicates different states dependent on the installed firmware (e.g., for ATS etc.)	Red	Depending on firmware
			Green	Depending on firmware
			Blue	Depending on firmware
CAN	CAN	This LED indicates the bus state of the CAN bus.	Red	Error
			Green	Operational
			White (Flashing)	Bus activity
MOST	MOST	This LED indicates the bus state of the MOST network. The LED is only available on platforms that are supporting MOST.	Red	Error
			Green	Net on
			White (Flashing)	Bus activity
FlexRay	FR	This LED indicates the bus state of the FlexRay bus.	Red	Error
			Green	Synced
			White (Flashing)	Bus activity
LIN	LIN	This LED indicates the bus state of the LIN bus.	Red	Error
			Green	Operational
			White (Flashing)	Bus activity
Power	⏻	This LED indicates a powered device.	Green	Powered device

5.2 Rear Panel

Different hardware platforms and software configurations are available for the OptoLyzer MOCCA compact. As a result some connectors might not be available for a specific variant of the OptoLyzer MOCCA compact. Figure 5.1 depicts a platform supporting MOST150.

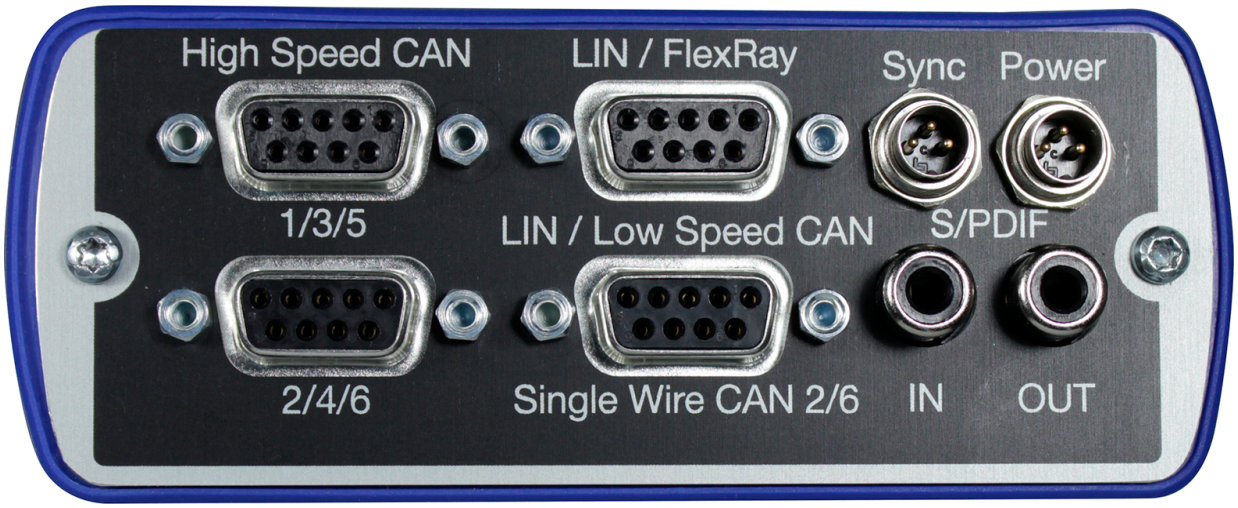

Figure 5.2 Rear Panel (E.G., with S/PDIF Interfaces)

All components of the rear panel are described below. Table 5.3 describes the connectors from top to bottom and left to right.

Table 5.3 Connectors on the Rear Panel

INTERFACE	DESCRIPTION
High Speed CAN 1/3/5 2/4/6	These two connectors offer six high speed CAN instances with baud rates from 40 kbit/s to 1 Mbit/s depending on the cable length. The CAN instances 1, 3, 4 and 5 are hard specified as high speed CAN interfaces whereas the CAN instances 2 and 6 can also be used as low speed or as single wire CAN interfaces. The CAN interfaces can be controlled by a customer application. Details about the CAN bus properties are described in Section 4.3.1, "CAN," on page 12. For the pin out refer to Section 6.1, "High Speed CAN," on page 21.
LIN / FlexRay	This DE-9 socket combines pins assigned to the FlexRay bus and pins assigned to the LIN channels 3, 4, 5 and 6. For the pin out refer to Section 6.2, "LIN / FlexRay," on page 22.
LIN / Low Speed CAN Single Wire CAN 2 / 6	This DE-9 socket combines two low speed and two single wire CAN interfaces (CAN instances 2 and 6) as well as two LIN channels (1 and 2). These CAN instances can be used either as high speed CAN interfaces or as low speed CAN interfaces or as single wire CAN interfaces. These CAN interfaces can be controlled by a customer application. For the pin out refer to Section 6.3, "LIN / Low Speed CAN and Single Wire CAN 2 / 6," on page 23.
Sync Power	The Synchronization (Sync) and the Power connector have the identical pin assignment i.e., each socket can be used either for synchronization or power purposes. Restrictions are described in Section Chapter 2, "Safety Instructions," on page 9. The OptoLyzer MOCCA compact is intended to be powered by the (optional available) wall power supply or by any other power supply which is capable to deliver 12 V and 1 A. If the wall power supply is not used, the included power cable has to be used to connect the 12 V supply with the OptoLyzer MOCCA compact. For the pin out refer to Section 6.4, "Synchronization and Power," on page 23.

Table 5.3 Connectors on the Rear Panel

<table>
<tr><th>INTERFACE</th><th colspan="3">DESCRIPTION</th></tr>
<tr><td rowspan="11">S/PDIF
IN
OUT</td><td colspan="3">Only OptoLyzer MOCCA compact platforms supporting MOST (MOST50 as well as MOST150) offer an S/PDIF. The output is compliant to the specification IEC 60958 [4] with 75 Ω and 0.5 Vpp (+ / -20%). The output is short circuit proof. The input circuit expects an unbalanced input and has an impedance of 75 Ω. Input sample rates from 32 to 96 kHz are accepted.
For the pin out refer to Section 6.5, "Digital Audio In/Out (S/PDIF)," on page 24.
The OptoLyzer MOCCA compact offers the bidirectional transfer of audio streams between the MOST synchronous channel and the S/PDIF connectors. An audio stream on a MOST synchronous channel can be routed to the S/PDIF output of the device. It is also possible to route a digital audio stream from S/PDIF input of the device to the MOST synchronous channel at the same time.
The following tables describe which S/PDIF formats are supported by the OptoLyzer MOCCA compact.</td></tr>
<tr><td colspan="3">Direction S/PDIF (IN) to MOST: S/PDIF data from an external S/PDIF source routed to the MOST network. The S/PDIF (IN) is routed through a sample rate converter. The signal can be either a mono or stereo signal.</td></tr>
<tr><td>IN</td><td>MOST</td><td>Supported Framerates</td></tr>
<tr><td>8 bit / channel</td><td>8 bit / channel</td><td rowspan="3">32 - 96 kHz</td></tr>
<tr><td>16 bit / channel</td><td>16 bit / channel</td></tr>
<tr><td>24 bit / channel</td><td>24 bit / channel</td></tr>
<tr><td colspan="3">Direction MOST to S/PDIF (OUT): S/PDIF data from the MOST network routed to an external S/PDIF sink. The signal can be either a mono or stereo signal.</td></tr>
<tr><td>MOST</td><td>OUT</td><td>Supported Framerates</td></tr>
<tr><td>8 bit / channel</td><td>8 bit / channel</td><td rowspan="3">32 - 96 kHz</td></tr>
<tr><td>16 bit / channel</td><td>16 bit / channel</td></tr>
<tr><td>24 bit / channel</td><td>24 bit / channel</td></tr>
</table>

Chapter 6 Pin Assignment of the Connectors

6.1 High Speed CAN

Connector type for both High Speed CAN connectors: DE-9

Figure 6.1 shows the connector pin assignment as it is visible on the rear panel.

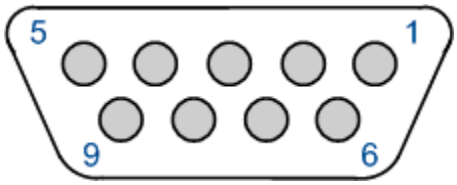

Figure 6.1 DE-9 Connector

The provided GND pins must not be used unless there is no other GND connection. These pins must not be used for supply purpose.

Table 6.1 Pin Assignment of Connector High Speed CAN 1/3/5

PIN NO.	SIGNAL	DESCRIPTION
1	CAN5-Low	Low-level CAN bus line
2	CAN1-Low	Low-level CAN bus line
3	GND	Signal ground
4	CAN3-Low	Low-level CAN bus line
5		Not connected
6		Not connected
7	CAN1-High	High-level CAN bus line
8	CAN5-High	High-level CAN bus line
9	CAN3-High	High-level CAN bus line

The provided GND pins must not be used unless there is no other GND connection. These pins must not be used for supply purpose.

Table 6.2 Pin Assignment of Connector High Speed CAN 2/4/6

PIN NO.	SIGNAL	DESCRIPTION
1	CAN6-Low	Low-level CAN bus line
2	CAN2-Low	Low-level CAN bus line
3	GND	Signal ground
4	CAN4-Low	Low-level CAN bus line
5		Not connected
6		Not connected
7	CAN2-High	High-level CAN bus line
8	CAN6-High	High-level CAN bus line
9	CAN4-High	High-level CAN bus line

6.2 LIN / FlexRay

Connector type (see Figure 6.1): DE-9

The provided GND pin must not be used unless there is no other GND connection. This pin must not be used for supply purpose.

Table 6.3 Pin Assignment of Connector LIN / FlexRay A/B

PIN NO.	SIGNAL	DESCRIPTION
1	LIN3	3rd LIN channel
2	Channel B BP	Positive bus line
3	GND	Signal ground
4	Channel A BM	Negative bus line
5	LIN4	4th LIN channel
6	LIN5	5th LIN channel
7	Channel B BM	Negative bus line
8	Channel A BP	Positive bus line
9	LIN6	6th LIN channel

6.3 LIN / Low Speed CAN and Single Wire CAN 2 / 6

Connector type (see Figure 6.1): DE-9

The provided GND pin must not be used unless there is no other GND connection. This pin must not be used for supply purpose.

Table 6.4 Pin Assignment of Connector LIN / Low Speed CAN

PIN NO.	SIGNAL	DESCRIPTION
1	CAN2-SW	High-level CAN2 bus line (single wire)
2	CAN2-Low	Low-level CAN2 bus line (low speed)
3	GND	Signal ground
4	CAN6-Low	Low-level CAN6 bus line (low speed)
5	LIN1	1st LIN channel
6	LIN2	2nd LIN channel
7	CAN2-High	High-level CAN2 bus line (low speed)
8	CAN6-SW	High-level CAN6 bus line (single wire)
9	CAN6-High	High-level CAN6 bus line (low speed)

6.4 Synchronization and Power

Figure 6.2 shows the pin assignment as it is visible on the rear panel.

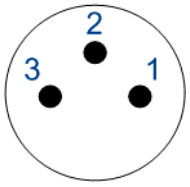

Figure 6.2 Pin Assignment of the Sync and Power Connector

Table 6.5 Pinning of the Sync and Power Connector

PIN NO.	SIGNAL	DESCRIPTION
1	12 V	Power supply
2	Sync	Synchronization line
3	GND	System ground

6.5 Digital Audio In/Out (S/PDIF)

Both digital connectors (S/PDIF In/Out) interface to a RCA phono socket.

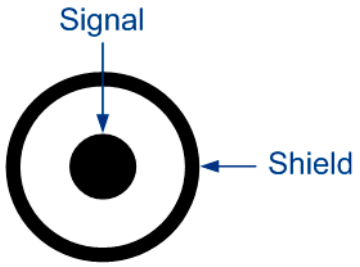

Figure 6.3 Pin Assignment of the S/PDIF Connector

The input circuit expects an unbalanced input and has an impedance of 75 Ω. The shield connects to system ground.

6.6 Analog Audio In/Out

Both the stereo line-in and the headphone stereo output interface to an audio phone connector.

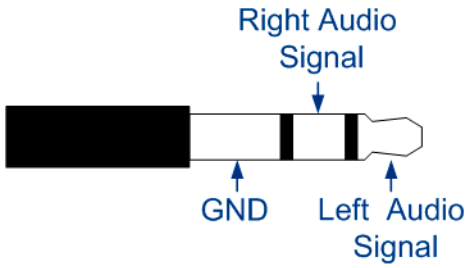

Figure 6.4 Pin Assignment of the Analog Audio In/Out Connector

6.7 USB

The USB port is a standard USB B-type receptacle.

6.8 Relay

The relay is able to switch 5 A as a potential free shutter. Please refer also to Chapter 2, "Safety Instructions," on page 9.

Relay type:

- assembled connector type: RIA 31182102
- connector type to be plugged: RIA 31169102

The pin assignment below is described as it is visible on the front panel.

Table 6.6 Pin Assignment of the Relay Connector

PIN NUMBER	DESCRIPTION
1 (left pin)	Shutter input
2 (right pin)	Shutter output

6.9 ECL

This connector provides two pins: The upper pin is for connecting the ECL/Trigger signal, the lower pin for connecting GND.

Connector type:

- assembled connector type: Molex 43045-0201
- connector type to be plugged: Molex 43025-0200

Table 6.7 Technical Values

PARAMETER	VALUE
Frequency	0...20 kHz
V_{Out}	7..18 V
R_{out}	20..60 kΩ
$V_{In,\ Low,\ Max}$	0.4 V_{Bat}
$V_{I,\ High,\ Min}$	0.6 V_{Bat}
$V_{In\ Hysteresis}$	0.05 V_{Bat}

6.10 MOST Connector

6.10.1 MOST50

Connector type: AMP 1376350-1

Figure 6.5 shows the pin assignment as it is visible on the front panel.

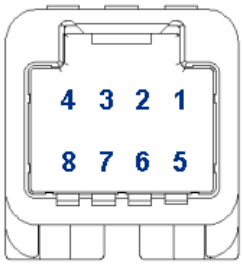

Figure 6.5 PIN Assignment of the MOST50 Connector

Table 6.8 Pin Assignment of the MOST50 Connector

PIN NUMBER	DESCRIPTION
1, 4, 5, 8	Not connected
2	ETXP
3	ETXN
6	ERXN
7	ERXP

6.10.2 MOST150

Connector type: Tyco Micro FOT (2+0).

The orientation of the Rx and Tx path is printed on the panel.

The MOST150 connector is designated for a 2+0 optical header cable. The direction is visible on the cable:

- Tx: Optical output for MOST network
- Rx: Optical input for MOST network

Chapter 7 Technical Specifications

The table below covers characteristics of the OptoLyzer MOCCA compact and its bus interfaces.

Table 7.1 Device and Bus Characteristics

PARAMETER		VALUE
RAM		512 kB external / 240 kB internal
Flash Memory		2 MB internal
Controllers		
µController		Renesas V850E2/FL4-h@160 MHz
CAN Transceivers		
	Low Speed CAN Transceiver	NXP TJA 1054
	High Speed CAN Transceiver	NXP TJA 1041
	Single wire CAN Transceiver	On Semiconductor® NCV7356
FlexRay Transceiver		NXP TJA 1080
LAN Transceiver		SMSC LAN89218
LIN Transceiver		SN65HVDA195
MOST Controllers		
	MOST25 (optical)	SMSC OS81050
	MOST50 (electrical)	SMSC OS81082
	MOST150 (optical)	SMSC OS81110
S/PDIF		I/O electrical via 2 x cinch, input sample rate 32 - 96 kHz
USB		Cypress EZ-USB 2.0

The table below covers mechanical characteristics of the OptoLyzer MOCCA compact.

Table 7.2 Mechanical Characteristics

PARAMETER	VALUE	UNIT
Dimensions (H x W x D)	45 x 112 x 116	mm
Weight	360	g
Ambient Temperature Range	-40..+70	°C

The table below covers electrical characteristics of the OptoLyzer MOCCA compact.

Table 7.3 Electrical Characteristics

PARAMETER	MIN	TYP	MAX	UNIT	COMMENT
Operating Voltage Range	7		16	V	
Current Consumption (operation)		500		mA	
Current Consumption (sleep)		< 1		mA	
Relay for external load (potential free shutter)			5	A	@ 12 V DC

Chapter 8 Revision History

Table 8.1 Customer Revision History

REVISION LEVEL & DATE	SECTION/FIGURE/ ENTRY	CORRECTION
Rev. 1.0 (04-29-13)	Initial Version	

Further Information

For more information on K2L automotive products, including integrated circuits, software, and MOST® development tools and modules, visit our web site: http://www.K2L.de. Direct contact information is available at: http://www.K2L.de/contact.

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